

gined; and he points out several precautions which should be observed in placing compasses on board such vessels.

"Researches on the Integral Calculus. Part I." By Henry Fox Talbot, Esq., F.R.S.

The author premises a brief historical sketch of the progress of discovery in this branch of analytical science. He observes that the first inventors of the integral calculus obtained the exact integration of a certain number of formulæ only; resolving them into a finite number of terms, involving algebraic, circular, or logarithmic quantities, and developing the integrals of others into infinite series. The first great improvement in this department of analysis was made by Fagnani, about the year 1714, by the discovery of a method of rectifying the differences of two arcs of a given biquadratic parabola, whose equation is $x^4 = y$. He published, subsequently, a variety of important theorems respecting the division into equal parts of the arcs of the lemniscate, and respecting the ellipse and hyperbola; in both of which he showed how two arcs may be determined, of which the difference is a known straight line. Further discoveries in the algebraic integration of differential equations of the fourth degree were made by Euler; and the inquiry was greatly extended by Legendre, who examined and classified the properties of elliptic integrals, and presented the results of his researches in a luminous and well-arranged theory. In the year 1828, Mr. Abel, of Christiana, in Norway, published a remarkable theorem, which gives the sum of a series of integrals of a more general form, and extending to higher powers than those in Euler's theorem; and furnishes a multitude of solutions for each particular case of the problem. Legendre, though at an advanced age, devoted a large portion of time to the verification of this important theorem, the truth of which he established upon the basis of the most rigorous demonstration. M. Poisson has, in a recent memoir, considered various forms of integrals which are not comprehended in Abel's formula.

The problem, to the solution of which the author has devoted the present paper, is of a more general nature than that of Abel. The integrals, to which the theorem of the latter refers, are those comprised in the general expression $\int \frac{P dx}{\sqrt{R}}$ where P and R are entire polynomials in x.

Next in order of succession to these, there naturally presents itself the class of integrals whose general expression is $\int \frac{P dx}{\sqrt[R]{R}}$, where the polynomial R is affected with a cubic, instead

of a quadratic radical; but Abel's theorem has no reference to these, and consequently affords no assistance in their solution. The same may be said of every succeeding class of integrals affected with roots of higher powers. Still less does the theorem enable us to find the sum of such integrals as $\int \phi(R) dx$; R being, as before, any entire polynomial (that is, containing at least two different powers of x),

and ϕ being any function whatever. The author then details the processes by which he arrives at the solution of this latter problem.

March 17, 1836.

Sir JOHN RENNIE, Knt., Vice-President, in the Chair.

Major T. Seymour Burt, Bengal Engineers, was elected a Fellow of the Society.

A paper was read, "On the reciprocal attractions of positive and negative electric Currents, whereby the motion of each is alternately accelerated and retarded." By P. Cunningham, Esq., Surgeon R.N. Communicated by Alexander Copland Hutchison, Esq., F.R.S.

The author found that a square plate of copper, six inches in diameter, placed vertically in the plane of the magnetic meridian, and connected with a voltaic battery by means of wires soldered to the middle of two opposite sides of the plate, exhibited magnetic polarities on its two surfaces, indicative of the passage of transverse and spiral electrical currents, at right angles to the straight line joining the ends of the wires. The polarities were of opposite kinds on each side of this middle line, in each surface; and were reversed on the other surface of the plate. The intensities of these polarities at every point of the surface were greatest the greater its distance from the middle line, where the plate exhibited no magnetic action. The author infers from this and other experiments of a similar kind, that each electric current is subject, during its transverse motion, to alternations of acceleration and retardation, the positive current on the one side of the plate and the negative on the other, by their reciprocal attractions, progressively accelerating each other's motions, as they approach, in opposite directions, the edge round which they have to turn. After turning round the edge their motion will, he conceives, be checked by coming in contact with the accelerated portions of the opposing currents to which they respectively owed their former increase of velocity; so that the one current will be retarded at the part of the plate where the other is accelerated. To these alternate accelerations and retardations of electric currents during their progressive motion, the author is disposed to refer the alternate dark and luminous divisions in a platina wire heated by electricity, as was observed by Dr. Barker.

" Meteorological Journal kept at Allenheads, near Hexham." By the Rev. William Walton. Communicated in a letter to P. M. Roget, M.D., Sec. R.S.

This Journal contains a register of the height of the barometer, taken at 9 A.M. and at 3 P.M. during every day in January and February 1836, with remarks on the state of the weather during a few particular days. The station where the observations were made is elevated 1400 feet above the level of the sea.